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A FRAMEWORK OF STRATEGY FOR THE DEVELOPMENT OF THE CONSTRUCTION SECTOR IN THE AFRICAN REGION

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Introduction

1. The fundamental objective of the strategy of Monrovia and the Lagos Plan of Action is regional, subregional and national self-sustaining development and economic growth based on collective self-reliance and aimed at improving the standards of living of the mass of the African people and reducing mass unemployment.

2. Self-reliance and self-sustained economic and social development implies comprehensive economic and social development planning in which human settlements policy component has a very significant role to play to ensure the integration of peoples welfare in development. As a matter of fact human settlements are places where social, economic and cultural facilities are located. Therefore, policies and programmes in the field of human settlements should constitute critical elements for attaining the objective of the Lagos Plan of Action.

3. Human settlements has a direct relationship to population trends and growth and living conditions of people. Because of this, apart from housing for the people, appropriate location and construction of infrastructure like utilities related to transportation and communication network education and medical facilities, etc. must form part of the planning of human settlements. The efficiency of development of human settlements will greatly be influenced by the complementary development of the various components of the infrastructure in a framework of unified approach. Failure in the past to adopt such a unified approach in formulating human settlement policies has been the cause for the desultory and ad hoc state of human settlements development in the African region. In other words the process of effective integration of human settlements development in national planning must first be based on an internal integration within human settlements development in terms of its major components.

4. As a tangible factor directly related to population trends and growth and living conditions of people, housing has naturally been the subject of prime attention in the framework of human settlements development. In practice, this has not been adequate for the fulfilment of the overall objective of effective integration of human settlements development in national planning because the complementary development of some of the other components of human settlements referred to earlier, in particular the infrastructure, has not kept pace with the rate of growth of housing development. A major reason for this situation is the imbalance in the rate of growth of the infrastructure connected with human settlements in relation to the rate of growth of human population and its needs. The further imbalance (which is rapidly increasing due to concentration of attention on urban development) between the urban and rural segments of human settlements development can also be traced to this situation.

5. A comprehensive programme of human settlements development has therefore to be formulated and implemented on the basis of an internal and external integration of human settlements through subsectoral programming and co-ordination. This subsectoral programming has to be specifically structured to meet the priorities and conditions prevailing in African countries.

GENERAL CONSIDERATIONS

Role of construction in human settlements development

6. Building and construction are a fundamental infrastructure for most forms of physical expansion and economic growth. The structure and growth of the construction sector may therefore said to be guided by the structure of economic growth as a whole. For example, in developed countries, investment in the construction sector is not only higher (over half of the total investment) than in any other sector but such investment is on a continuous basis and the formulation and adoption of clearly defined policies and strategies for the construction sector forms part of the policies and strategies for national growth. In Africa, the construction industry constitutes about 40-56 per cent of total capital formation compared to the European norm of 51 to 66 per cent.

7. The clientele of the construction sector is very large covering practically all the sectors of the economy and is not confined as generally misunderstood, to the housing sector alone. Organized housing accounts for only 30-35 per cent of the output of the construction industry. (This percentage does not take into account the housing activity in the informal sector in the urban and specially the rural areas). The larger share of 65 to 70 per cent is taken by major works and public infrastructure (dams and irrigation, industry, transport, public health education and other services). In the planning of the construction industry development, it is important therefore to ensure that a proper balance is maintained at all times in terms of continuity of demand not only from the housing component but also from the infrastructure components like roads, schools, hospitals, water and electricity supply, sewage disposal system, etc., which are directly related to housing from the point of view of the needs of the human population and from the other sectors of national economy, such as industry, communications, transport, agriculture, trade, etc. It is only on the basis of such a balance that the construction industry will be able to develop itself adequately both in quantitative and qualitative terms and thereby fulfill its responsibilities in respect of human settlements development as a whole.

Present position of the construction sector

8. The construction sector comprises three components namely, building materials; construction equipment and accessories; and construction services (representing skills such as the expertise of architect, town planner, quantity surveyor, civil engineer, contractor, mason, plumber, carpenter, electrician, welder, etc., and the supporting construction labour force). The completeness or effectiveness of the contribution of the construction industry will be judged in terms of all these components. Unfortunately, the general position in this respect at present in most African countries does not reflect the required co-ordination and harmonization between building materials, construction equipment and accessories and construction services in regard to their availability.

9. Experience from most African countries indicates that one of the factors which stall the implementation of some of their economic and social programmes is the state of unreadiness of the construction sector (in quantitative and qualitative terms) to meet the needs. There is a heavy dependence on foreign construction technologies services and imported building materials. The construction systems as well as the building codes and regulations which are in vogue and which guide construction practices are in general of foreign origin and are, very often ill-suited to the actual needs as well as conditions in African countries. As a result, the cost of building construction is very high in the region. This situation affects seriously human settlements development and requires to be corrected through the formulation of special policies and adoption of special promotional measures in order to strengthen basically the capacity of the construction sector.

Needs of the construction sector

10. A major drawback of most attempts to develop the construction capacity of African countries is the failure to adopt a comprehensive approach which takes into account all the component factors that constitute and influence the con struction industry. Among these factors the following should be considered as basic for any rational and concrete approach to the problem:

(i) Full awareness of the construction potential (including demand) both on short and long term basis,

(ii) Continuous government and public support to the construction sector to enable it to improve its contribution both in quantitative and qualitative terms,

(iii) Financial strength and investment capacity of the construction sector,

(iv) A strong base of indigenous skills and manpower,

(v) Adequate availability of required building materials, construction machinery, accessories and tools,

(vi) Technology development and improvement in respect of building materials, constructions and construction practices.

11. The fundamental approach to any realistic solution of human settlements problems requires a proper assessment of the nature and magnitude of the problems. It may be said that in most of the member States, the problem has been that human settlements planning is being done on a narrow angle of sectoral self sufficiency. For example, the plans for a health programme would imply the construction of health infrastructure such as hospitals, clinics or welfare centres. Even though the implementation of such a planned health programme will to a large extent depend on the condition of the construction sector (particularly construction and building materials capacity) to play an important and timely part the usual position is that the authorities who are responsible for planning the health programme are not in a position to appraise and properly organize the required interrelationship between the proposed health programmes on the one hand and the construction capacity and building materials on the other. Examples of such non-co-ordination can be found in the planning of other sectors also. The main reason for this is that this type of approach at national level ignores

the fact that programmes from all sectors of the economy require construction in one form or the other that such demands arise at about the same time and that the capacity of the construction sector to be able to meet for example the needs of the health sector must fit in with its overall capacity to meet the construction demands from all its other clients like industry education agriculture transport etc. While it cannot be the responsibility of the health sector for example to ensure that the construction sector is in a position to meet the composite demand from all client sectors, it should reasonably satisfy itself that within its overall capacity the construction sector would be able to meet its (that is the health sector s) demand and in time. Towards this purpose, it should plan its demand on the construction sector in detail and well in advance and make it known through appropriate consultations with the construction sector. 1/ So too must the other client sectors do and have their respective demands noted in time by the construction sector. This exercise must be followed by a self assessment by the construction sector of its capacity, limitations and needs for meeting the totality of demand from all of its client sectors and working out a development programme which would take care of its needs.

12. The construction sector as it exists today in the African region is not well organized for the above mentioned task. It is a task which it can no longer neglect. It is however a task which it cannot successfully undertake by itself and in which it will badly need the services of a focal point in the government which can co ordinate the various demands, take into account their priorities and urgency, critically assess the capacity of the construction sector to respond to the total national demand and assist the construction sector in obtaining its needs.

13. It is therefore obvious that the formulation and execution of settlements programmes which depend on construction capacity should be prepared to

- reflect the construction requirements from all sectors

- correlate with the construction capacity of the country

- specify building materials requirements (in quantitative and qualitative terms) that are needed to support the total construction programme

- provide effective governmental support to strengthen the capacity of the construction sector.

14. Unless human settlements programmes are so prepared to reflect the requirements from all sectors as well as relate these needs to the national construction capacity and building materials production capacity structural bottlenecks would continue to exist and inhibit the successful implementation of the programmes.

1/ See paragraph 25.

15. As explained earlier organized housing claims a relatively smaller share (30-35 per cent) of the construction demand. Nonetheless it has a priority claim and represents a vital segment of the demand. Housing as a block demand and on social, economic and political considerations will continue to be an index of construction and has to be expanded in quantity and quality. Rural housing which is at present entirely a self effort and exists under severe handicaps will require special attention in the framework of gradually increased urban rural integration of human settlements. Even if housing represents only a smaller part of the construction demand, it still is the only pre-determinable yardstick or factor for computing the construction demand on a continuous basis. The housing needs stem from three basic sources: rapid population growth, rapid urbanization and decadence of existing stock. Other secondary factors such as demolition, natural disaster, etc. also contribute. New formulae for estimating the quantitative housing requirements satisfactory to African conditions need to be evolved based on population growth and movement trends as well as the gradual improvement in the income and life style of the population. By all estimates, the quantitative housing needs of Africa will be enormous and there will be increase in the rate of growth of this demand. Although the least densely populated region in the world Africa is experiencing the most rapid urban growth on an average of 5 per cent per annum.

16. The other major dimension of construction demand as briefly explained earlier will be from other larger and national public infrastructures which pertain to economic development but nonetheless are indirectly related to the growth and quality of human settlements. These demands will need to be assessed on the basis of the long range economic development plan of each country.

17. The qualitative aspects of construction are also of significant importance and must receive special attention in the planning of the development of the construction sector. These cover on the one hand the quality of the buildings and the building materials used therein and on the other the techniques used in the building process. For example, by correlating technical specifications, the building materials which are appropriate for the particular construction needs would be used to ensure that the quality of the construction is not compromised. In most African countries, constructions are based on building practices which are of foreign origin, these practices are most often ill suited to the actual needs of the region.

18. Adoption of foreign building practices also necessitate the utilization of imported building materials and hampers the local development of building materials based on available raw materials. Africa's net imports of building materials for the year 1976 and 1977 amounted to US$3,020 million and US$3,680 million respectively, while the total expenditure on construction amounted to approximately US$10 billion for each of the two-years. Self-reliance in respect of building materials would mean very substantial savings in foreign exchange.

19. It is obvious that actions to reduce the dependance on imports of building materials should receive priority attention. The demand for Cement and Steel as the dominant building materials would continue because of their indispensability for particular applications in some urban and public constructions. Production facilities for the two materials must therefore be set up or expanded wherever feasible. Co-operation arrangements between interested countries may be necessary in some cases because of the large size of capital investments involved in the

setting up of cement and steel plants, the scattered availability of the basic raw materials like limestone, iron ore, coal etc.; and the general position of country level demands for cement and steel not matching the minimum economic size of conventional cement and steel plants. There is however scope for minimizing the use of costly and scarce materials like cement and steel through their judicious utilization in construction. The present tendency of considering cement, for example, as the only durable construction material should give place to a recognition of the potential of alternative materials and to their effective utilization. Indeed, these alternative materials can also provide some advantages in cost reduction in construction which is one of the objectives of the Lagos Plan of Action.

20. The programme for qualitative improvement in construction should also take care of the needs of improved walling and roofing of rural housing in order to enhance its durability and improve its resistance to deterioration on account of fungus, insects, fire, rain, wind etc. The constructions are generally based on locally available materials and it is possible to improve their quality through technological innovations and governmental assistance, without basically interfering with the rural custom of self-construction at very low cost.

21. It is seen from the above-mentioned position that the building materials industry is a key element of the construction sector. Its rapid expansion has to be brought about on governmental as well as private initiative and through a network of large, medium and small scale plants as appropriate to the conditions in individual countries or groups of countries. The main objective of the planning of the production of building materials should be to ensure their availability at the points of demand for the construction industry.

STRATEGY FOR DEVELOPMENT

22. It would be difficult to suggest a single policy or strategy which would be suitable for all African countries. Each country must design its strategy as is appropriate to its needs and priorities. Nevertheless, the improvement of the building construction situation aimed at achieving self-sufficiency in the earliest possible time calls for a package of short, medium and long term policies and strategies, their translation into practical programmes and activities and the provision of support facilities in the form of institutional structures and personnel for carrying out the activities.

23. To achieve this, the construction sector must be re-organized and developed in terms of its two basic components, namely (a) building materials, and (b) construction services since each of these has its distinct identity. It is important that the strategies and activities aimed at construction development should cover the two components individually and together on a balanced basis. National, subregional and regional responsibilities will need to be identified. To this end the following guidelines for strategy are suggested.

Basic prerequisites of the strategy

24. The establishment of requisite support facilities including institutional structures and manpower development has to be an important component of the strategy as much as the policies themselves are. The policies and strategies will, in turn need to be elaborated clearly in terms of specific national, subregional and regional responsibilities according to the needs of the countries and the subregion.

Need for nodal approach at national level

25. It has been observed that the responsibilities at the national level for the development of the construction sector are generally diffused in most countries over a number of departments and agencies and consequently, the implementation of programmes tends to be on individual and un-co-ordinated basis. This causes a lopsided development of the construction sector with an inherent weakness apart from the wastefulness of expertise, resources and developmental time. If the prevailing situation of shortages of construction skills and materials has to be basically rectified it is necessary to undertake a co-ordinated and in-depth study to visualize the total construction demand potential (covering all sectors of economy) on a long term perspective of about 20-25 years, identify the individual elements of the demand potential outline the specific input and output linkages for each of the elements draw up a comprehensive plan of action for the development of the various elements, specify agency responsibilities and provide a centralized direction, co-ordination monitoring and support to the implementation. The announcement of such a comprehensive and detailed plan will greatly stimulate the public and private building and building materials trade to undertake their own individual planning activities in time and on the basis of an assured demand for their services and the continuity of the demand. In fact, one of the basic reasons for the lack of initiative on the part of the indigenous construction sector to qualitatively and quantitatively analyse the requirements and plan its own growth is the uncertainty of what kind of support-promotional, financial, etc. - would be available. From the standpoint of organizing an effective centralized direction, co-ordination, monitoring and support so vital to the development of the construction sector on a new basis, it would be useful if, as a matter of development strategy, African governments could **set up** a 'nodal mechanism' in one of their appropriate ministries/departments with special mandate and focal authority to plan comprehensively the total development of this sector on the basis of the needs of each user-sector, organize the required inputs and linkages in time, help to resolve bottlenecks and delays and ensure the efficient implementation of the programmes and projects decided upon. It is gratifying to note that some African governments have recently set up such a machinery or re-oriented their administrative systems and procedures for this purpose.

Nodal approach at subregional level

26. There is need for a similar focal point at subregional or intergovernmental level in order to organize jointly the development of specific aspects of the construction sector, for example, raw materials, building materials production, building and building materials technology, construction manpower training etc. The establishment of "Building Materials and Construction Industries Development Council" within the framework of existing intergovernmental committees or economic communities or on any other mutually agreed basis is suggested for this purpose. The nodal mechanisms suggested in paragraph 25 above could be the national linkages for the Development Council.

Regional component of development strategy

27. Developmental impetus at regional level is also a necessity in order to supplement national and subregional efforts by way of providing guidelines on overall development of the construction sector and organizing the linkages and co operation arrangements within the African region and with countries outside the African region and with international agencies. Technology promotion, dissemination of information, feasibility studies, consultancy services, training programmes, promotion of pilot plants and demonstration projects are some examples of the potential for regional contribution to the development strategy. The Economic Commission for Africa has launched a regional development programme for this purpose covering aspects pertaining to policy and institutions, building materials production building and building materials research, construction services etc. The current phase of this programme is scheduled to terminate in December 1993. The active support of African governments for and their close involvement in the various activities of this programme is essential and through such support and involvement, the future phases of the regional programme with new dimensions oriented to the specific priority needs of African countries, should be determined and implemented.

Guidelines for the development of specific components

(i) Building materials

28. Building materials development must have a two-fold objective (a) increased availability through increased production capacities and (b) economy in production costs through maximum use of local raw materials, adoption of less sophisticated technologies, efficiency of plant operation and maintenance and decentralization of production wherever feasible. The reason for this is evident in the fact that building materials account for 50-60 per cent of construction costs and hence should be a prime target for reducing construction costs.

Raw material aspects

29. The nature and technical capacity of building materials industries in Africa vary from country to country. While some industries operate very satisfactorily, some others suffer from the following chronic defects, among others: a high input of imported raw materials with a correspondingly low input of local raw materials, inappropriate technology and under-utilization of capacity. Most building materials industries in Africa operate on the basis of technology imported from highly industrialized countries. Barring exceptions such as plate-glass, most materials in common use such as burnt brick, lime and cement have the advantage of a relatively broad choice of production technology. It is necessary to assess the merits of available technologies and choose those best suited to local materials and needs and reduce the need to import raw materials which meet certain criteria if alternate materials which are equally good but have slightly different properties are available locally. A detailed inventory of the available raw materials resources (with particular attention on limestone, dolomite, gypsum, clays, quartz, felspar and secondary species of wood) has to be organized and the compilation and dissemination of information on their availability and scope of utilization must receive high

priority. There are several agricultural residues such as rice husk straw, coconut and palm fibre and industrial wastes such as metal slag boiler coal ash etc., which are excellent supplementary raw materials which can be converted into building materials for walling and roofing of buildings. Governments must adopt strategies which will promote their increased availability and utilization. Simple technologies for their utilization are available.

Cement

30. Because cement is universally used in all types of buildings and civil engineering projects, the cement industry is a very important subsector of the building materials industry. The process of manufacturing cement is a simple one but nowadays, it is so highly mechanized that a large capital outlay is required. Although the per capita consumption in Africa is still lower than the world average, the production of cement has increased more rapidly in Africa than anywhere else in the world. The highest rate of growth was recorded in the West African subregion. In spite of this progress, Africa is still a net importer of cement. West, Central and some parts of Eastern Africa face a chronic shortage of cement. As a matter of first priority cement producing countries must explore all possibilities of optimizing production within existing plant-capacities through process innovations and improved plant operation and maintenance techniques. Secondly, a 20-25 year development programme for increasing cement production in the African region through the expansion of these plants and the creation of new plant capacities in new locations should be drawn up and its implementation should be organized and effectively combined with a development programme for quarrying of limestone and gypsum. It would be best if neighbouring countries could organize the required infrastructure on a mutual co-operation basis and share the output of raw materials and the production of cement. Thirdly, as a basic strategy, new concepts of cement production involving smaller size plant capacities (for example 25 to 100 tonnes per day) and minimal mechanization must be adopted wherever feasible so that small size raw materials reserves are not ignored on the basis of conventional Western practices and technologies which are oriented to production on a very large scale. Such decentralization of cement production will respond to local demands without long distance transportation constraints.

31. At the same time, as explained earlier, the strategy must also be aimed at curbing the consumption of cement through promoting the production and utilization of alternate materials like lime which are also comparatively easier to produce and cheaper than cement. Hydrated lime can be produced easily from locally available raw materials in most African countries and can effectively meet the end-use of construction in many cases in terms of performance durability and utility considerations. It is a building material which deserves to be given some importance in the efforts towards self-reliance in the construction sector. In a sense, the earlier process of cement gradually replacing lime must be reversed on the basis of specific promotional strategies including the popularization through pilot plants and demonstration projects. Indeed, the lime industry can be well developed even as village and small town activity on the basis of simple equipment, technology and skills and very small investments.

Clay products

32. In almost all African countries, walling materials of one kind or another are being manufactured. Burnt clay bricks and hollow concrete blocks are two of the most commonly used materials produced at an industrial level. Brickmaking is an ancient art, which is practiced in accordance with traditional methods which have

been perpetuated to modern times and often leave much to be desired. The methods of manufacturing bricks and the management of the plants engaged in their production have to be improved even in modern brickworks which exist in a few countries. The almost total absence of experts specializing in burnt brick masonry has made the situation worse. In almost all countries, there is increasing use of hollow cement blocks which are regarded as "permanent construction material". Although their physical properties (porosity, heat insulation and sound proofing, etc.) are ill-suited to African conditions, and in some cases they have mechanical drawbacks (because of being poorly manufactured) these materials have in the end been accepted as the ultimate solution even for the construction of the most modest shacks. In view of the high price of cement and its scarcity in some countries and because good clay for making bricks can be found almost everywhere in Africa brickworks should be promoted on the basis of improved technologies and technical assistance on ways of improving the quality of production. Brickworks are also ideal for decentralized activity. These brickworks can also undertake the production of clay roofing tiles as a substitute for the galvanized iron and asbestos cement sheets which are very expensive, scarce and are generally imported.

Other materials

33. In the field of electrical fittings, wires, cables and fixtures, porcelain and other ceramic ware, plate and sheet glass, etc. Africa depends heavily on foreign sources and the expenditure on the imports of these items is substantial. Where national markets are too small for the local manufacture of these items subregional or other basis of co-operative arrangements for production should form part of the strategy.

Supply and distribution system

34. Above all, irrespective of whether these building materials are manufactured in the public or private production system, governmental assistance will be necessary in ensuring their availability wherever demand exists for these materials. Without this assistance, the construction sector will continue to remain handicapped and powerless to discharge its obligations properly. Appropriate transportation, supply stocking and distribution infrastructure should therefore be set up. Banks can be a useful media for promoting an efficient stocking and distribution system.

(ii) Construction services

35. The construction industry expands and contracts significantly in response to fluctuations in demand. This is a pattern characteristic of the majority of African countries. Often a substantial annual fluctuation in the output of certain sectors of the industry can be observed following the initiation and completion of major infrastructural works (dams, large irrigation schemes airports, harbours etc.) For such projects, the industry relies on the vast reserves of unskilled labour easily recruited when a new job is started and dismissed as it nears completion. The price it pays for this ability to adapt to demand is high in terms of the effective use of human, technical and financial resources. Major works may also include jobs relating to the manufacturing industry transport, trade, roads public health education and other public services. The major works subsector accounts for between 65 and 70 per cent of all building and has a direct impact on the development of the construction industry in African countries.

Basic handicaps

36. The major handicaps faced by the construction industry are firstly fluctuating demand and uncertaintyof construction opportunities and secondly, its very low priority status in the eyes of financing institutions. Additional problems (for indigenous construction sector) are stiff competition from foreign companies (who have the advantage of finance, modern technology and construction skills) and lack of infrastructure (local organization and access to latest technologies). The development strategy to assist the construction industry must therefore be basically aimed at these aspects.

Need for comprehensive construction planning

37. The starting point should be to set up a national committee composed of all user-sector departments (agriculture, education, health, industry, energy, trade, communications, transportation, tourism, employment, etc.) as well as concerned private interests and entrust it with the responsibility of drawing up a long term (say 20-25 years) perspective of construction demand (quantitative and qualitative). The 'nodal mechanism' referred to earlier (in paragraph 25) should analyze this demand in terms of its specific elements (building materials, construction services, finance, manpower, institutional facilities, etc.) and outline the sectoral and sub-sectoral linkages and responsibilities to enable the government take appropriate decision and announce a national plan for construction sector (indicating the short, medium and long term phases and the expected inputs from government and non-governmental sources). The plan will basically be a blue-print of the construction demands that are envisaged over a long period and serve as an advance guideline for the construction sector as well as other services (financing, education, employment, industr etc.) to prepare themselves individually and collectively for meeting the demand. The government, through the 'nodal mechanism' should periodically review and guide the progress of actions for the fulfilment of the objective of the plan.

38. Within the framework of above general strategy, immediate attention will be necessary on the following:

Reformulation of building codes and regulations

39. One of the serious impediments to the development of the construction and building materials industries is the irrelevance of prevailing building codes and regulations to the actual needs of African countries. Even after 20 years of independence, almost all the countries are still adopting the codes laid down by the colonial regimes based on the needs of their own countries. It is true that here and there some changes had been made but they are not significant. When asked about the criteria governing some provisions, Government authorities responsible for applying these rules often find it difficult to rationalize them. There is a diversity of standards and specifications on building materials which add greatly to construction costs. The tests and specifications required in respect of one and the same material are those laid down in AFNOR, BS, DIN or ASTM specifications depending on whether the source of funds or the firm responsible for the job is French, British, German or American. Little need is paid to local conditions in the country where the work is being done. Finally, the regulations applicable to urban planning categorically prescribe the use of specific materials regardless of whether the materials are available or not. Therefore from the perspective of both production and of intra-African marketing, the development of the building

materials and construction industries calls for the formulation and application of new codes, regulations and other uniform texts covering the subregions whose bounderies are determined by the presence of similar physical and sociological conditions. The task of preparing such texts could be undertaken with the help, for example, of the subregional Building Materials and Construction Industries Development Councils referred to in paragraph 26.

Building and building materials research

40. This is a vital component of construction sector development. At present there are very few research institutions in Africa in the field of building and building materials. The shortcoming and difficulties mentioned above, all of which help to make the building sector particularly costly for African countries, can, for the most part be adequately solved through well organized research on building practices and production of building materials. If research is to make an effective contribution to the building industry, specific targets must be set for it and a well defined approach adopted. Research should begin by identifying the functional needs and should in that sense be of an applied nature. It should also develop the building materials and construction industry through standardization and by carrying out studies in pilot units. Since the building and building materials industry generally has no large organizational base and has insufficient financial means to enable it to carry out its own research, there should be specialized research institutions to provide the industry the logistic support which it needs to solve its special problems. The research centres should also be instrumental for the development of an African cadre of construction and construction materials specialists and technicians.

41. Since research is very costly, and the needs and conditions in the building industry are somewhat identical in some countries, African governments should in the first instance, explore the possibility of promoting a joint facility for building and building materials research on subregional or any other basis and use it as an instrument to gradually develop/strengthen national research centres. In this connexion, based on the recommendations of the meeting of the Directors of African building and building materials research institutes (convened by ECA in Bujumbura in April/May 1980), feasibility studies have been carried out by ECA on the establishment of a joint research centre for building and building materials research in the West African subregion (for catering to the needs of Benin, Guinea, Ivory Coast, Mali, Niger, Togo and Upper Volta through the transformation of the existing 'Centre de la Construction et du Logement' at Cacavelli, Lome, Togo) and in the Economic Community of the Great Lakes Countries (for catering to the needs of Burundi, Rwanda and Zaire). Follow-up actions for promoting the establishment of the two research centres are under the consideration of the Governments concerned. The scope for establishing similar joint research centres in other subregions needs to be studied. Along with the research services, there is also need for setting up a suitable network of user-oriented information services pertaining to building materials and construction industries, at national, subregional and regional levels with appropriate international linkages.

Construction technology

42. Experiences from all over Africa indicate that there is considerable scope for improvement in the prevailing construction techniques. On most construction projects, the use of imported materials, inefficient and insufficient use of sophisticated machinery/equipment, the neglect of overabundant local labour and material resources leave much to be desired. Apart from this, the tendency (by engineers and architects) to over-design and the failure to correlate construction capacity, building materials and skills to the accepted designs underline the distance between professional practice and the reality of the needs of the region. In effect, Africa is yet to adopt the appropriate construction technology that duly recognizes the local needs and utilizes the resource endowments of the region. Engineers and architects in the region must recognize the potential for technological flexibilities that exists in the construction sector and the fact that the appropriate construction technology cannot be practiced only at the project site but right from the planned phase. In order to foster the adoption of the appropriate construction technology the strategy should cover the following:

- an effective co-ordination between the designer, the builder and the client;
- an effective evaluation of the construction capacities and available construction machinery and equipment;
- development and use of local building materials and skills,
- the use of simple designs which meet the basic engineering requirements,
- the adoption of realistic standards which reflect local conditions.

Field services

43. Efficiency in the construction sector would largely be determined by the availability of certain vital field services which most contractors in Africa cannot afford to provide by themselves because of their financial constraints. In a region where construction projects are widely dispersed (and limited in scale), an effective development strategy should include the provision of field services such as technical support, plant pool, repair and maintenance services as well as material depots evenly distributed in the country to service the construction sector. This is an area for the attention of governments, financial institutions and associations of builders for formulating innovative schemes to assist the contractors.

44. Even on large scale projects such as dam construction which could utilize large numbers of unskilled labour, technical skills for estimation, supervision and management are crucial for efficient execution. Building construction for example utilizes a high percentage of artisanal skills which are lacking in most countries. Quite apart from the apparent shortage, it appears that most contractors cannot afford, financially, to employ permanently such skilled personnel. The construction sector would, therefore, benefit if such services are provided by governments or allowed to be organized with government assistance. Some African coun-ries (for example, Kenya, Swaziland, Togo and Zaire) have already initiated action in this direction. The scale of their operations will need to be enlarged. In countries where such services are now absent, efforts should be made for their promotion.

45. Another area which requires field service in the construction sector is the provision of plant hire facilities. To most individual contractors in Africa, the solution to the problems of high costs of construction machinery, increasing maintenance cost, the variety of machinery types required at each project site, the scarcity of operating and maintenance skills coupled with gross under utilization of plant capacity would seem to lie in a scheme which could provide central plant hire services facility as a more practical and economical alternative to individual ownership. Plant hire facilities are generally insufficient in Africa and where they exist, the hire rates are prohibitive. It will therefore, be helpful if governments themselves could come forward to sponsor the creation of plant pools to be utilized by contractors who could hire the equipment on reasonable charges.

46. Closely related to the above is the problem of absence of machinery repair workshops in most African countries. The absence of such facilities has rendered several construction machinery and equipment inoperable in many African countries. Most of the individual contracting firms are either too small to maintain and operate independent repair workshops or do not possess sufficient number of machinery to justify the establishment of such facilities on their own resources. Under such conditions African governments should endeavour to provide the said facilities at central locations to the benefit of operators in the sector.

47. A final area which requires such field service facility is the storage and distribution of building and construction materials referred to earlier. Quite often, the central location of building materials depots too far from points of demand the stock of materials that are unsuitable for any immediate purpose and difficulties in transportation and distribution, contribute to the creation of an unfavourable operating atmosphere to the construction sector. Governmental assistance is therefore required to establish distribution centres, evenly located to facilitate ready availability of materials for the smooth execution of projects.

Skills and manpower

48. The skills and manpower situation in the construction sector requires a critical examination. In many countries, there is a serious problem of shortage of skilled technicians like architect, town-planner, civil engineer, quantity surveyor, etc. The cadre of indigenous contractors is insufficient and is weak in terms of construction experience and services and lacks financial and technical strength to take on large construction assignments. Although the sector could be a major source of mass employment and there is an abundance of labour force at its disposal, the job suitability of the labour leaves much to be desired. Unfortunately the upgrading of requisite artisanal skills to raise productivity has not received sufficient attention. The available training facilities in the region are not adequate to make up the shortage of skills in most countries. This has resulted in the migration of trained manpower from the poorer countries to the more affluent ones, thus worsening an already grave position. An important area of development in the construction sector therefore is the provision of adequate training facilities for construction skills at all levels. While the emphasis of training requirements may vary from country to country, the area offers scope for co-operation at the subregional level.

Finance

49. Financial requirements for construction operations in the region range from procurement needs of machinery, equipment and materials, to wage payment, consultancy services and even basic tendering regulations. Thus, an usual feature of construction operations is the financial priming. In most African countries since contractors are paid according to the work completed, a primary responsibility rests on the operator to provide the initial funding. Thus even if the client could assist in providing the financial priming to initiate the project, the contractor will need sufficient capital resources to bridge the period between commencement and completion. Barring large firms and affluent contractors, most contractors are greatly handicapped in this respect.

50. Needless to mention, the contractors also encounter financial difficulties through such practices as instalment payments and the withholding of "retainers fees" as a guarantee against poor workmanship. In certain countries, contractors have to deposit a certain percentage of the estimated value of the projects when tendering. They do not get the needed assistance from most creditors. For example, building materials dealers are often unwilling to provide even short term credit facilities to contractors. Most African countries have no financial institution meant specifically to assist the construction sector. Commercial banks are reluctant to deal with most contractors due to the lack of collateral. Even where such facilities are offered, interest rates are high and repayment periods short.

51. African governments must seriously explore the possibilities for innovative schemes and means to provide adequate finance to the construction sector. Establishment of national construction banks, the creation of revolving funds jointly by contractors and governments and reducing the level of retainers fees could be very positive approaches to solve the financial problem of the sector.

52. Solutions to the financial problem could also involve regional co operation whereby African Governments could pool their resources to establish a financial institution or a fund for the purpose. The SHELTER AFRIQUE programme, promoted by the African Development Bank, for example, is a healthy move in that direction.

53. Ethics and Code of Conduct on the part of contractors, sound and firm financial control, and efficiency in the management of constructions are some of the means within the control of the construction sector to strengthen itself.

CONCLUSION

54. It will be clear from the foregoing presentation that the reformation of the construction sector requires major developmental initiative and actions not only from the sector itself but also from the governments.

55. The primary impetus for the development of the sector will be needed at the national level. African Governments must therefore assign, in their overall economies, a basic role for the construction sector and accord high priority for the development of building materials and construction services. As part of this strategy, they must formulate special and innovative policies and introduce matching promotional measures to enable the sector to reorganize itself with increased and improved capabilities for meeting the construction demands of the national economy as a whole, quantitatively as well as qualitatively. Along with policy measures

institutional support is vital for the growth of the sector. In particular, construction demand planning on a comprehensive basis, financial assistance, skills development and training and building and building materials research should receive special attention in this regard.

56. As a permanent catalyst for fostering the growth of the sector, the creation of "nodal mechanisms" at national level and of 'Building Materials and Construction Industries Development Councils at subregional level is recommended. It should be the task of these two mechanisms to assist governments in the planning of the development of the various components of the construction sector taking into account the sector-wise construction needs of the country and in the formulation and execution of appropriate projects.

57. A comprehensive development programme for the construction sector must therefore be drawn up covering, besides policies and promotional aspects, raw materials processing and supply, building materials production and supply, management and operational skills pertaining to building materials production and construction services, technology development and infrastructure relating to transport and vocational training, etc.

58. As a first step, construction demand planning on a long term perspective of say 20-25 years must be undertaken by the governments on the basis of a practical assessment of the various sectoral plans and needs of the economy and the needs of construction arising from these needs. The construction sector should be notified of the totality of the demand and assisted in drawing up its own development programme in terms of the various components and implementing it.

59. The development programme will have elements which will require impetus or assistance at the subregional and the regional levels as for example, large scale development of raw materials or building materials, skills and manpower training, building and building materials research and information services etc. Effective inter-African co-operation arrangements will need to be explored and organized for the implementation of such programme elements.

60. At the regional level, there is great need and scope for assisting the African countries in the formulation and implementation of co-ordinated programmes for the development of the construction sector. Much useful work has already been done in this direction by the Economic Commission for Africa through its Building Materials and Construction Industries Development Programme. Apart from the efforts towards promoting the creation of physical facilities for increased building materials production and for building and building materials research, it has enabled the African Governments to re-determine their priorities for the development of the sector. The programme with its emphasis on a comprehensive approach and a developmental strategy which covers the individual elements of the building materials and construction industries has made a favourable impact in many countries and has led to positive actions at the national, subregional and regional levels. There is need for continuing the programme on the basis of new dimensions of activities in accordance with the priorities of the countries in order to strengthen the national efforts towards speedy achievement of self-sufficiency in the construction sector.